(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 738 606 A1

(12) EUROPEAN PATENT APPLICATION

published in accordance with Art. 158(3) EPC

(43) Date of publication:
23.10.1996 Bulletin 1996/43

(21) Application number: **95936749.1**

(22) Date of filing: **08.11.1995**

(51) Int. Cl.[6]: **B41J 25/316**, B41J 2/32

(86) International application number:
PCT/JP95/02277

(87) International publication number:
WO 96/14213 (17.05.1996 Gazette 1996/22)

(84) Designated Contracting States:
DE FR GB IT

(30) Priority: **08.11.1994 JP 273259/94**

(71) Applicant: **SEIKO INSTRUMENTS INC.**
Chiba-shi, Chiba 261 (JP)

(72) Inventor: **KOHIRA, Hiroyuki,**
c/o Seiko Instruments Inc.
Chiba-shi, Chiba 136 (JP)

(74) Representative: **Sturt, Clifford Mark et al**
J. MILLER & CO.
34 Bedford Row,
Holborn
London WC1R 4JH (GB)

(54) PRINTER

(57) The invention has its object to uniformize a condition of a printing head pressed against a platen. A printer comprises a frame, a platen (1), a printing head (2) and a pressure body (3), said frame having right and left side walls which are separated from each other with a gap conforming to a width of a recording medium. The platen (1) is mounted between the both side walls and is positioned in front or rear of the printing head (2). The pressure body (3) is incorporated into the frame to cause the printing head (2) in rear to be pressed against the platen (1) in front. The printing head (2) is capable of inclining and freely moving front and rear and right and left depending upon a position of the platen (1), and the pressure body (3) is in point contact with the printing head (2). With such arrangement, the printing head (2) follows the platen (1) front and rear and right and left during printing action and is pressed against it.

FIG. 1A

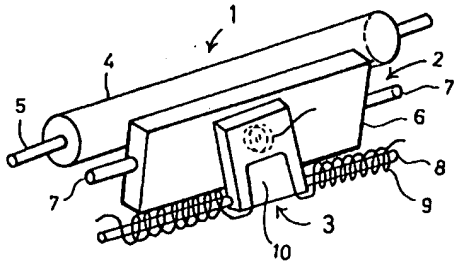


FIG. 1C

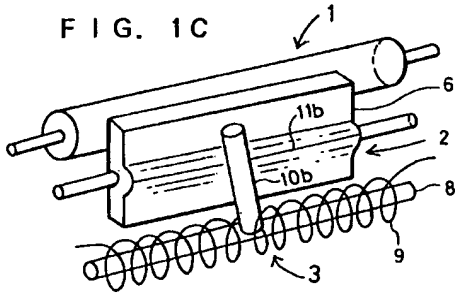
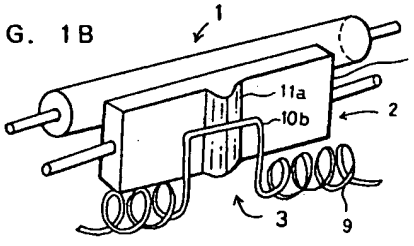


FIG. 1B



EP 0 738 606 A1

Description

Field of the Invention

The present invention relates to a printer with a platen and a printhead. More particularly, the present invention relates to a structure of supporting a printhead.

Background Art

Fig. 7 shows an example of a conventional printer. The printer includes a platen 101 which is rotatably provided to bridge along the width direction of a recording medium (not shown). The printer also has a printhead 102 which is disposed at the back of the platen 101. Further, the printer includes a pressing body 103 to make by pressing the printhead 102 at the back in contact with the platen 101 in front. The pressing body 103 has a vertical shaft 104 and a horizontal shaft 105. A torsion spring 106 is wound on the horizontal shaft 105 to generate pressing force. The vertical shaft 104 pierces the printhead 102 to rotatably support the printhead 102.

Fig. 8 shows another example of a conventional printer. (A) represents a printhead 201 and (B) represents a frame 202. As shown in the figure, the frame 202 has left and right side walls 203 and 204 which are disposed each other at a distance depending on the width of a recording medium (not shown). The printhead 201 is incorporated between the left and right side walls 203 and 204. In this example, protrusions 205 and 206 are formed at the both ends of the lower portion of the printhead 201, respectively. Through holes 207 and 208 are formed in the protrusions 205 and 206, respectively. On the other side, in the lower portions of the left and right side walls 203 and 204, through holes 209 and 210 are formed, respectively. In a state where the printhead 201 is incorporated in the frame 202, the above-mentioned through holes 207, 208, 209, and 210 are aligned. By inserting a shaft (not shown) in the through holes, the printhead 201 can be provided to bridge rotatably with respect to the frame 202.

Fig. 9 shows still another example of a conventional printer. A pair of upper and lower pins 302 and 303 are formed at the left end of the width of the printhead 301. In the same manner, a pair of upper and lower pins 304 and 305 are formed at the right end of the width direction of the printhead 301. On the other hand, the frame 306 has left and right side walls 307 and 308 which are disposed each other at a distance depending on the width of a recording medium (not shown). A guide slit 309 is formed in the left side wall 307. The guide slit 309 branches on the way into a vertical branch portion 310 and an arc-like branch portion 311. In the same manner, a guide slit 312 is formed in the right side wall 308. The guide slit 312 branches into a vertical branch portion 313 and an arc-like branch portion 314. The above-mentioned printhead 301 is incorporated in the frame 306 dropwise from the above. In a fabricated state, the upper pin 302 is engaged with the arc-like branch portion 311 while the lower pin 303 is engaged with the vertical branch portion 310. In the same manner, the upper pin 304 is engaged with the arc-like branch portion 314 while the lower pin 305 is engaged with the vertical branch portion 313. In this state, the printhead 301 rotates backward and forward with the lower pins 303 and 305 being the center of the rotation. Here, the upper pins 302 and 304 are guided by the ark-like branch portions 311 and 314, respectively.

In the conventional printer shown in Fig. 7, the printhead 102 is axially supported by the vertical shaft 104 of the pressing body 103 so that the printhead 102 can tilt right and left. Therefore, when the printhead 102 at the back is made in contact with the platen 101 in front by the action of the torsion spring 106, the printhead 102 can tilt and move right and left to absorb the deviation. However, since the horizontal shaft 105 connected with the vertical shaft 104 is supported with respect to the frame, the printhead 102 is made by pressing in contact with the platen 101 in a fixed tilted position with respect to the direction of backward and forward. Since the extent of the tilt of the printhead 102 in the directions backward and forward can not be adjusted, it is difficult to completely absorb the dimensional error and the installation error of the platen 101.

In the conventional printer shown in Fig. 8, the through holes 207, 208, 209, and 210 must be aligned after the printhead 201 is incorporated in the frame 202. The positioning is time-consuming and therefore, the fabricativity is inferior. In addition, since the printhead 201 and the frame 202 are coupled each other by a horizontal shaft (not shown), the printhead 201 rotates only backward and forward. As the printhead 201 can not tilt and move right and left, the deviation with the platen (not shown) can not be absorbed. Still further, since the tilted position in the directions of backward and forward is regulated, the dimensional error and the installation error of the platen can not be absorbed.

In the conventional printer shown in Fig. 9, the printhead 301 can be incorporated in the frame 306 dropwise from the above, and thus fabricativity is improved compared with the conventional printer shown in Fig. 8. However, this printer has a problem that, since the guide slits 309 and 312 having branches are formed in the left and right side walls 307 and 308, the strength of the frame is lowered.

An object of the present invention is to provide a printer having a structure with which a printhead is made by pressing uniformly in contact with a platen. Another object of the present invention is to provide a printer with excellent incorporativity of a printhead and excellent strength of a frame.

Disclosure of the Invention

A printer according to the present invention comprises a frame, a platen, a printhead, and a pressing

body as a basic structure. The frame has left and right side walls which are provided each other at a distance depending on the width of a recording medium. The platen is rotatably provided to bridge between the two side walls. The printhead is also provided between the two side walls, and is disposed at the back of the platen. The pressing body is incorporated in the frame to make by pressing the printhead at the back in contact with the platen in front. As characteristic matters, the printhead can tilt and move backward and forward and right and left according to the position of the platen, and the pressing body is in point contact with the printhead. With such a structure, in print operation, the printhead can be made by pressing in contact with the platen following up the platen.

Specifically, the printhead and the pressing body are formed of separate components which can be separately incorporated. One of the printhead and the pressing body has a convex spherical surface portion, and the other has a plane portion. The convex spherical surface portion and the plane portion are in point contact with each other. Alternatively, the printhead and the pressing body may have convex cylindrical surface portions which intersect each other to be made in point contact with each other. Preferably, the printhead has a wide upper portion which is made by pressing in contact with the platen and a narrow lower portion which is integral with the wide upper portion. On the other hand, the left and right side walls have thin portions to be engaged with the wide upper portion and thick portions to be engaged with the narrow lower portion, respectively.

According to the present invention, a printhead can tilt and move backward and forward and right and left according to the position of a platen. Further, a pressing body is in point contact with a printhead. Since the operating portion of the press is a point, a printhead can tilt and move backward and forward and right and left, and can be made by pressing uniformly in contact with a platen. By this, deviation can be prevented, which is effective for improving the print quality (by preventing a blur) and the linearity of advance of a recording medium. Further, since a pressing body and a printhead are independent of each other, the printhead can be incorporated or exchanged with ease. Still further, a printhead is T-shaped having a wide upper portion and a narrow lower portion integral with the wide upper portion. According to this, the side walls of a frame are divided into thin portions and thick portions. With such a structure, the strength of the frame is improved. Further, a printhead can be incorporated in the frame dropwise from the above, and the dead space inside the frame can be effectively utilized. Different from the conventional printer, since there is no need to insert a horizontal shaft and the incorporation can be done from above, the fabricativity is improved. Since through holes through which a horizontal shaft is inserted are not necessary, the structure of a die for forming a printhead can be simplified (sliding is unnecessary) to lower the cost.

Brief Description of the Drawings

Fig. 1 are schematic drawings showing basic structures of a printer according to the present invention. Fig. 2 is also a schematic drawing showing a basic structure of a printer according to the present invention. Fig. 3 is a plan view and a right elevational view showing a specific structure of a printer according to the present invention. Fig. 4 is a plan view and an elevational view showing the main portion of the printer shown in Fig. 3. Fig. 5 is a plan view and an elevational view showing an example of variation of the structure shown in Fig. 4. Fig. 6 is also a plan view and an elevational view showing another example of variation of the structure shown in Fig. 4. Fig. 7 is a schematic drawing showing an example of a conventional printer. Fig. 8 is a schematic drawing showing another example of a conventional printer. Fig. 9 is a schematic drawing showing still another example of a conventional printer.

Best Mode for embodying the Invention

Preferred embodiments of the present invention will now be described in detail in the following with reference to the drawings. Fig. 1 shows basic structures of a printer according to the present invention, and three different aspects are denoted as (A), (B), and (C). A printer shown in Fig. 1(A) includes a frame (not shown), a platen 1, a printhead 2, and a pressing body 3 as a basic structure. The frame has left and right side walls which are disposed each other at a distance depending on the width of a recording medium (not shown). The platen 1 is rotatably provided to bridge between the two side walls. Specifically, the platen 1 comprises a cylindrical elastic body 4 made of rubber or the like and a rotating shaft 5 which pierces the center of the elastic body 4. Both ends of the rotating shaft 5 are supported by the left and right side walls of the frame. The printhead 2 is also provided to bridge between the two side walls of the frame, and is disposed at the back of the platen 1. Specifically, the printhead 2 comprises a head-supporting body 6 on which a thermal element (not shown) is mounted and a pair of pins 7 located at both ends of the head-supporting body 6. The head-supporting body 6 and the pins 7 can be integrally formed using material such as aluminum. The pressing body 3 is incorporated in the frame to make by pressing the printhead 2 at the back in contact with the platen 1 in front. Specifically, the pressing body 3 has a horizontal shaft 8, a torsion spring 9 wound on the horizontal shaft 8, and a plane member 10 attached in the middle of the horizontal shaft 8. The torsion spring 9 generates pressing force to press forward the printhead 2 via the plane member 10. By this, the thermal element, etc. provided on the printhead 2 are made in contact with the platen 1.

As characteristic matters of the present invention, the printhead 2 is flexibly engaged with the two side walls of the frame via the pins 7 at its both ends, and can tilt and move backward and forward and right and

left according to the position of the platen 1. On the other hand, the pressing body 3 is in point contact with the printhead 2. With such a structure, during printing operation, the printhead 2 can be made by pressing uniformly in contact with the cylindrical body 4 following up the rotation of the platen 1. It should be noted that the printhead 2 and the pressing body 3 are formed of separate components which can be separately incorporated. In the present embodiment, while the pressing body 3 has a plane member 10, at the back of the head-supporting body 6, a convex spherical surface portion 11 is formed. The structure is such that the plane member 10 and the convex spherical surface portion 11 are in point contact with each other.

The printer shown in Fig. 1(B) has basically the same structure. Like reference numerals designate corresponding parts to those in the printer shown in Fig. 1(A) so as to be understood easily. In the present embodiment, the head-supporting body 6 has in the middle of its back a vertical convex cylindrical surface portion 11a. On the other hand, the pressing body 3 comprises a torsion spring 9 shown by a thick line. The middle portion 10a of the torsion spring 9 extends in the horizontal direction and has a convex cylindrical surface portion. The vertical convex cylindrical surface portion 11a formed on the side of the head-supporting body 6 and the convex cylindrical surface portion formed on the horizontal middle portion 10a on the side of the pressing body 3 intersect each other to be kept in point contact with each other.

The printer shown in Fig. 1(C) also has basically the same structure. Like reference numerals designate corresponding parts to those in the printer shown in Fig. 1(A) so as to be understood easily. At the back of the head-supporting body 6, a convex cylindrical surface portion 11b which extends in the horizontal direction is formed. On the other hand, the pressing body 3 has a vertical post 10b substantially in the middle of the horizontal shaft 8. The vertical convex cylindrical surface of the post 10b and the horizontal cylindrical surface portion 11b on the side of the head-supporting body 6 intersect each other to form point contact between the bodies.

Fig. 2 shows another example of a structure of a printer according to the present invention. (A) represents the printhead 2 and (B) represents a frame 12. The printhead 2 has the head-supporting body 6. A pair of upper and lower pins 7a and 7b are formed at the right end of the head-supporting body 6. In the same manner, a pair of upper and lower pins 7a and 7b are also formed at the left end of the head-supporting body 6. The head-supporting body 6 and the pins 7a and 7b can be integrally formed using material such as aluminum. Different from a conventional printer, there is no need to provide through holes through which a horizontal shaft is inserted, and thus, the structure of a die for forming the head-supporting body 6 can be simplified (sliding is unnecessary) to lower the cost. As shown in the figure, the head-supporting body 6 has a wide upper portion 6a which is made by pressing in contact with the platen (not shown) and a narrow lower portion 6b. Therefore, the head-supporting body 6 according to the present embodiment is substantially T-shaped in the plan view.

On the other hand, the frame 12 has left and right side walls 13 and 14 which are provided each other at a distance depending on the width of a recording medium (not shown). The right side wall 14 has a thin portion 12a to be engaged with the wide upper portion 6a of the head-supporting body 6 and a thick portion 12b to be engaged with the narrow lower portion 6b of the head-supporting body 6. A substantially arc-like guide slit 14a is formed in the thin portion 12a while a vertical guide slit 14b is formed in the thick portion 12b. In the same manner, the left side wall 13 is divided into the thin portion 12a and the thick portion 12b. The thin portion 12a has a substantially arc-like guide slit 13a while the thick portion 12b has a vertical guide slit.

The distance between the two thin portions 12a which face each other across the width direction is set so as to exactly fit the width of the wide upper portion 6a of the head-supporting body 6. In the same manner, the distance between the two thick portions 12b which face each other across the width is set so as to fit the width of the narrow lower portion 6b of the head-supporting body 6. Thus, it is possible to provide a step between the thin portion 12a and the thick portion 12b on the side of the frame 12 according to the difference in size of the wide upper portion 6a and the narrow lower portion 6b on the side of the head-supporting body 6. With such a structure, the mechanical strength of the pair of left and right side walls 13 and 14 can be improved. Since the thick portion 12b is provided utilizing the dead space inside the frame 12, the width of the frame does not increase compared to a conventional one. The frame 12 having such a structure can be formed by injection molding of resin or the like.

The printhead 2 is incorporated in the frame 12 dropwise from the above. By this, the printhead 2 is provided to bridge between the left and right side walls 13 and 14 of the frame 12. Looking at the right side wall 14, the upper pin 7a of the printhead 2 is engaged with the ark-like guide slit 14a while the lower pin 7b is engaged with the vertical guide slit 14b. With respect to the left side wall 13, the same thing can be said. With such a structure, the printhead 2, while bridging across the frame 12, rotates backward and forward with the lower pin 7b being the center of the rotation. It should be noted that a predetermined clearance is left between the pin 7b and the vertical guide slit 14b so that the printhead 2 can move backward and forward a little. When the printhead 2 rotates backward and forward, the upper pin 7a moves along the ark-like guide slit 14a. Even when the printhead 2 rotates forward and touches the platen (not shown), the pin 7a does not touch the deepest portion of the guide slit 14a so that the printhead 2 can tilt right and left. It should be noted that the guide slit 14a precisely aligns the printhead 2 with

respect to the vertical direction. With such a structure, the printhead 2 can tilt and move backward and forward and right and left according to the position of the platen. On the other hand, as described in the above, the pressing body (not shown) is in point contact with the printhead 2. Thus, during printing operation, the printhead 2 can be made by pressing uniformly in contact with the cylindrical surface of the platen following up the rotation of the platen. In other words, the dimension error and the installation error of the platen can be absorbed, and the deviation and the like can be effectively prevented.

Fig. 3 is a plan view and a right elevational view showing an example of a specific structure of a printer according to the present invention. This printer is basically embodied by the combination of the structure of the pressing body shown in Fig. 1(A) and the structures of the printhead and the frame shown in Fig. 2. Therefore, like reference numerals designate corresponding parts so as to be understood easily. As shown in the figure, this printer is fabricated using the frame 12. The frame 12 has left and right side walls 13 and 14 which are at a distance depending on the width of a recording medium. The platen 1 is rotatably provided to bridge between the two side walls 13 and 14. As described in the above, the platen 1 has the cylindrical elastic body 4 made of rubber or the like and a rotating shaft 5. The rotating shaft 5 is supported by the left and right side walls 13 and 14, and is driven to rotate via a motor and a series of gears (not shown). By this, a recording medium is fed. The printhead 2 is also provided to bridge between the two side walls 13 and 14, and is disposed at the back of the platen 1. As described in the above, the printhead 2 has the head-supporting body 6 to the front face of which a board 15 is attached. On the board 15, a thermal element and a driving circuit are mounted. Further, a pressing member 16 of a flexible connector to be connected with the board 15 is also attached to the front face of the head-supporting body 6. On the other hand, the convex spherical surface portion is formed at the back of the head-supporting body 6. As described in the above, the head-supporting body 6 is divided into the wide upper portion 6a and the narrow lower portion 6b. The pin 7a formed in the wide upper portion 6a is engaged with the ark-like guide slit 14a formed in the thin portion 12a of the side wall 14. The pin 7b formed in the narrow lower portion 6b of the head-supporting body 6 is engaged with the vertical guide slit formed in the thick portion 12b of the side wall 14.

The pressing body 3 has the horizontal shaft 8, by which the pressing body 3 is incorporated in the frame 12. The torsion spring 9 which generates predetermined pressing force is wound on the horizontal shaft 8. The plane member 10 is attached to the horizontal shaft 8. The plane member 10 is in point contact with the convex spherical surface portion 11 of the head-supporting body 6 described in the above. By this, the pressing body 3 makes the printhead 2 at the back in contact with the platen 1 in front. The right elevational view shows the state of the contact by pressing. The thermal element mounted on the front face of the head-supporting body 6 is in close contact with the cylindrical elastic body 4 of the platen 1 and performs predetermined print operation to a recording medium in between. Here, the upper pin 7a of the printhead 2 can move in the arc-like guide slit 14a, and thus, the printhead 2 can tilt right and left to absorb deviation with the platen 1. Further, the lower pin 7b of the head-supporting body 6 is engaged with the side wall 14 with a little clearance being left, and thus the head-supporting body 6 can tilt and move backward and forward. In other words, fine control of the tilted position of the printhead 2 with respect to the platen 1 is possible. In other words, the positioning of the printhead 2 is regulated by the upper pin 7a only in the vertical direction, and the incorporation is such that the printhead 2 can move right and left and backward and forward with respect to the frame 12.

Fig. 4 shows only the main portion of the printer shown in Fig. 3 to clarify the relation of the arrangement. As shown in the figure, the pressing body 3 makes by pressing the printhead 2 in contact with the platen 1. The printhead 2 is attached to the frame by a pair of upper and lower pins 7a and 7b so as to move backward and forward and right and left. The convex spherical surface portion 11 of the printhead 2 is in point contact with the plane portion 10 of the pressing body 3. With such a structure, the printhead 2 is made by pressing in contact with the platen 1 following up the platen 1 backward and forward and right and left.

Fig. 5 shows an example of variation of the structure shown in Fig. 4. Like reference numerals designate corresponding parts so as to be understood easily. It should be noted that this example of variation corresponds to the structure shown in Fig. 1(B). The convex cylindrical surface portion 11a which extends in the vertical direction is formed at the back of the printhead 2. On the other hand, the middle portion 10a of the torsion spring 9 incorporated in the pressing body 3 extends in the horizontal direction. The cylindrical surface portion of the middle portion 10a is orthogonal to and is in point contact with the cylindrical surface portion 11a on the side of the printhead 2.

Fig. 6 shows another example of variation of the structure shown in Fig. 4. Like reference numerals designate corresponding parts so as to be understood easily. In the present example, the convex cylindrical surface portion 11b in the horizontal direction is formed at the back of the printhead 2. On the other hand, the vertical convex cylindrical surface portion 10b is formed in the middle of the plane member 10 of the pressing body 3. The convex cylindrical surface portions 10b and 11b which are orthogonal to each other are in point contact with each other to enable the printhead 2 to tilt and move backward and forward and right and left.

Industrial Utilization

According to the present invention, since the operating portion of the press is a point, a printhead can tilt and move backward and forward and right and left, and can be made by pressing uniformly in contact with a platen. Therefore, it is effective for improving the print quality and the linearity of advance of a recording medium. Further, Since a pressing body and a printhead are independent of each other, a printhead can be removed (exchanged) with ease. Still further, by making a printhead to be T-shaped, the dead space in a frame is effectively utilized, and at the same time, fabrication by dropping a printhead from the above is made possible. Together with this, a thin portion and a thick portion are provided in a side wall of a frame so as to improve the strength of the frame.

Claims

1. A printer comprising a frame having left and right side walls which are provided each other at a distance depending on the width of a recording medium, a platen rotatably provided to bridge between said side walls, a printhead also provided to bridge between said side walls and disposed at the back of said platen, and a pressing body which is incorporated in said frame and which makes by pressing said printhead at the back in contact with said platen in front, characterized in that said printhead can tilt and move backward and forward and right and left according to the position of said platen, and said pressing body is in point contact with said printhead, whereby, in print operation, said printhead is made in contact with said platen following up said platen.

2. The printer according to claim 1, characterized in that said printhead and said pressing body are formed of separate components which can be separately incorporated.

3. The printer according to claim 1, characterized in that one of said printhead and said pressing body has a convex spherical surface portion, the other has a plane portion, and said convex spherical surface portion and said plane portion are in point contact with each other.

4. The printer according to claim 1, characterized in that said printhead and said pressing body have convex cylindrical surface portions which intersect each other, and said convex cylindrical surface portions are made in point contact with each other.

5. The printer according to claim 1, characterized in that said printhead has a wide upper portion which is made by pressing in contact with said platen and a narrow lower portion which is integral with said wide upper portion, and said left and right side walls have thin portions to be engaged with said wide upper portion and thick portions to be engaged with said narrow lower portion, respectively.

6. The printer comprising a frame having left and right side walls which are provided each other at a distance depending on the width of a recording medium, a platen rotatably provided to bridge between said side walls, a printhead rotatably supported between said side walls and disposed at the back of said platen, and a pressing body which makes by pressing said printhead at the back in contact with said platen in front, characterized in that said printhead has a wide upper portion which is made by pressing in contact with said platen and a narrow lower portion which is integral with said wide upper portion, and said left and right side walls have thin portions supporting said wide upper portion and thick portions supporting said narrow lower portion, respectively.

FIG. 1A

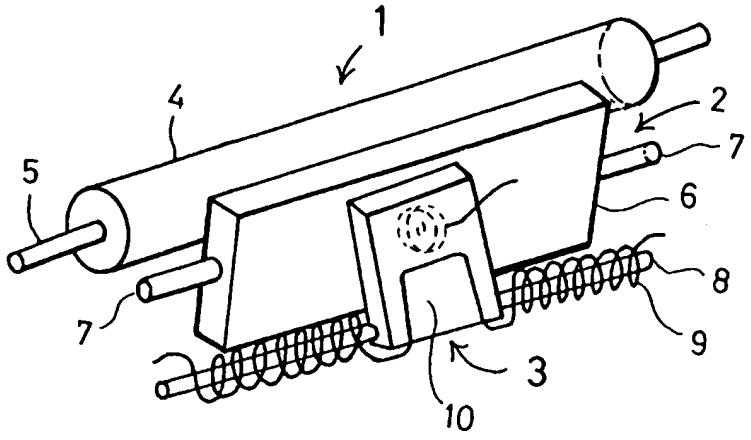


FIG. 1B

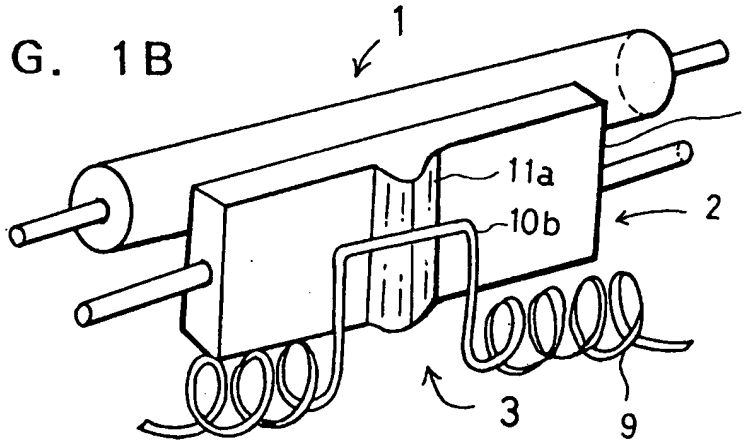


FIG. 1C

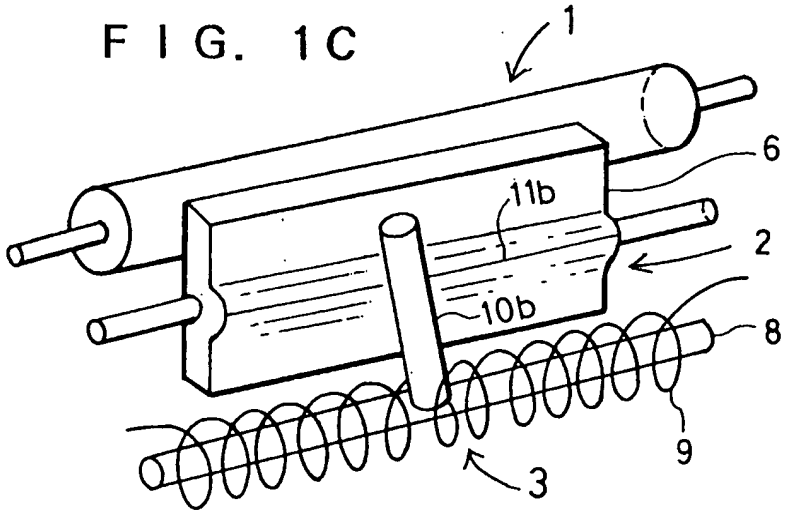


FIG. 2A

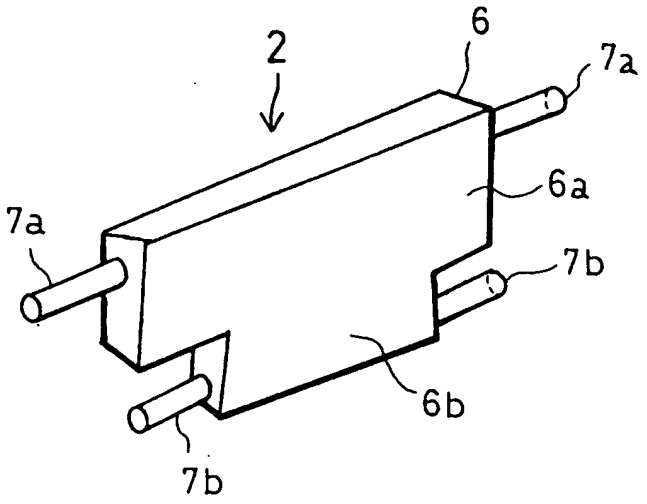


FIG. 2B

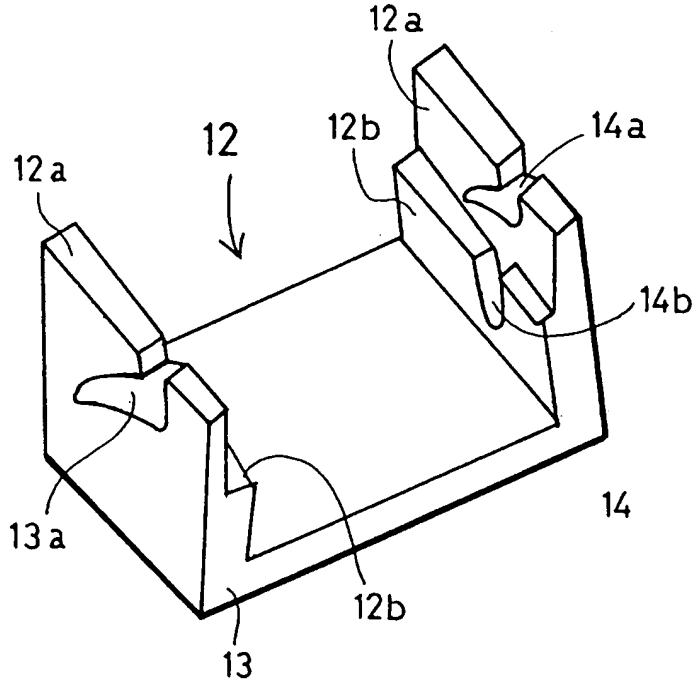


FIG. 3B

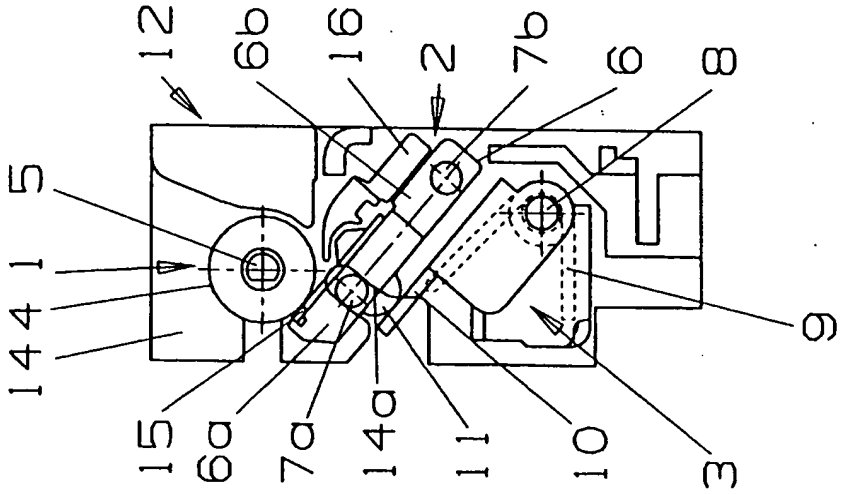

12
6b
16
2
7b
6
8
5
1
4
14
9
15
6a
7a
14a
11
10
3

FIG. 3A

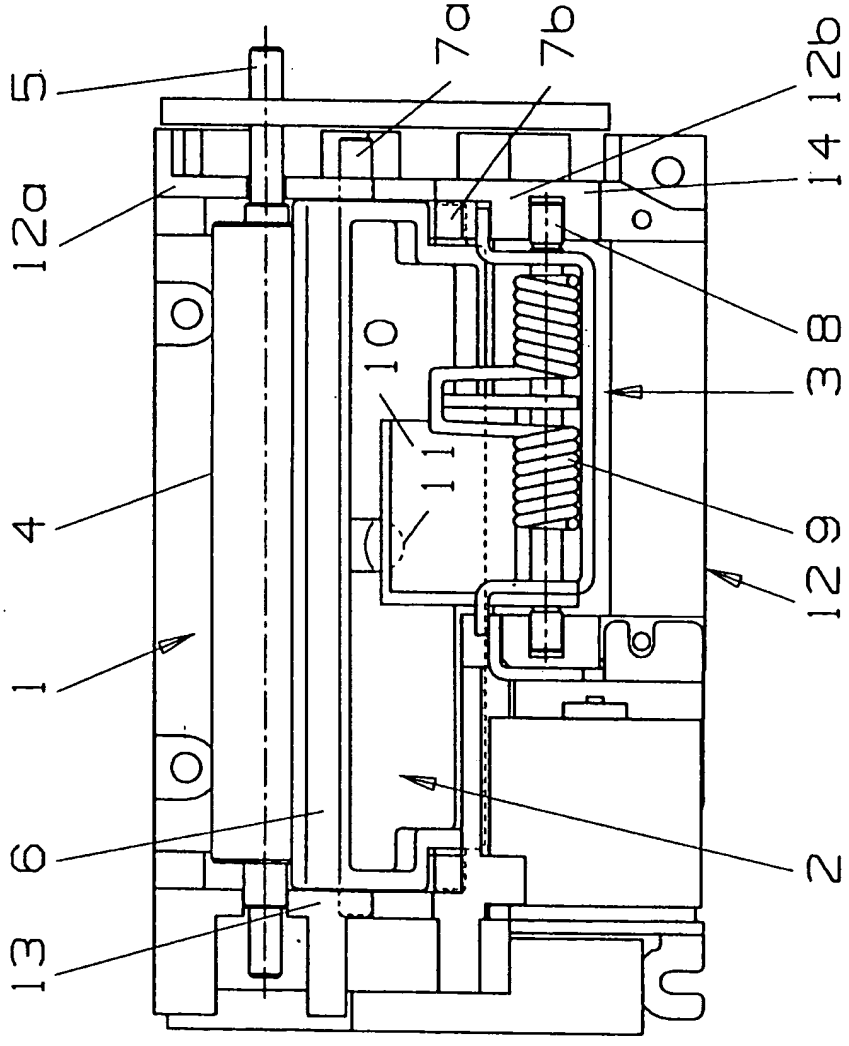

7a
7b
12b
5
14
12a
8
10
3
11
4
9
12
1
6
2
13

FIG. 4A

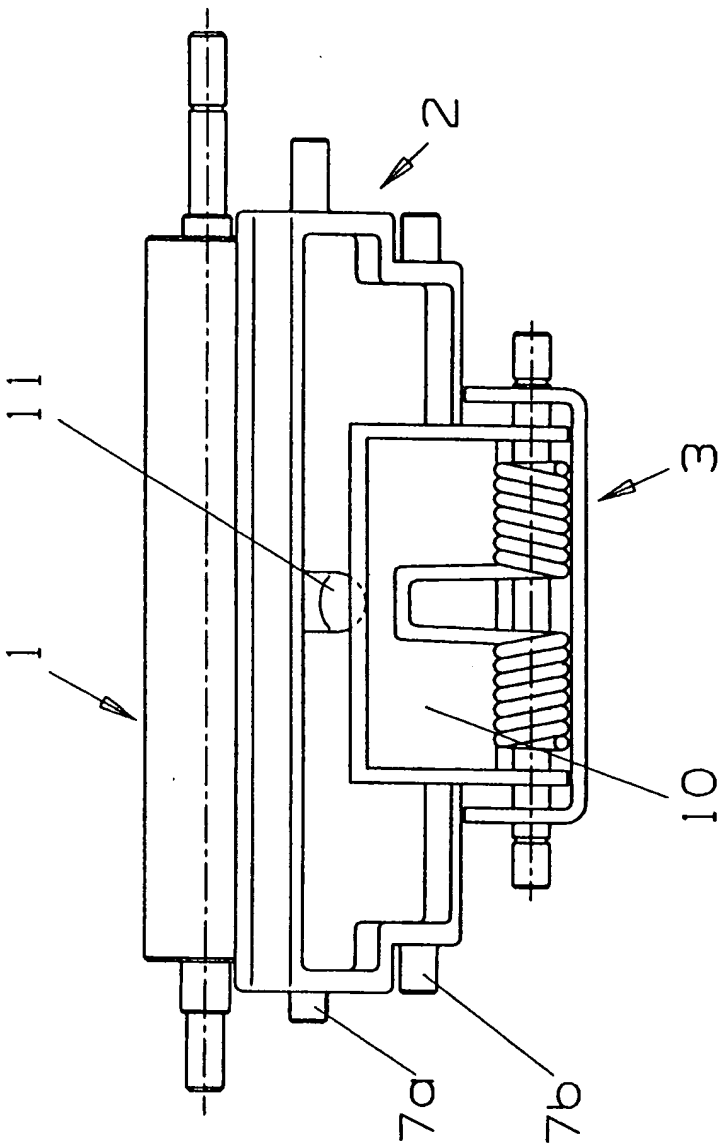


FIG. 4B

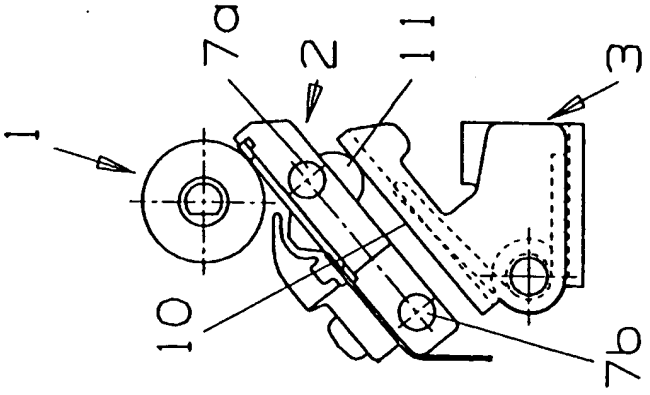


FIG. 5A

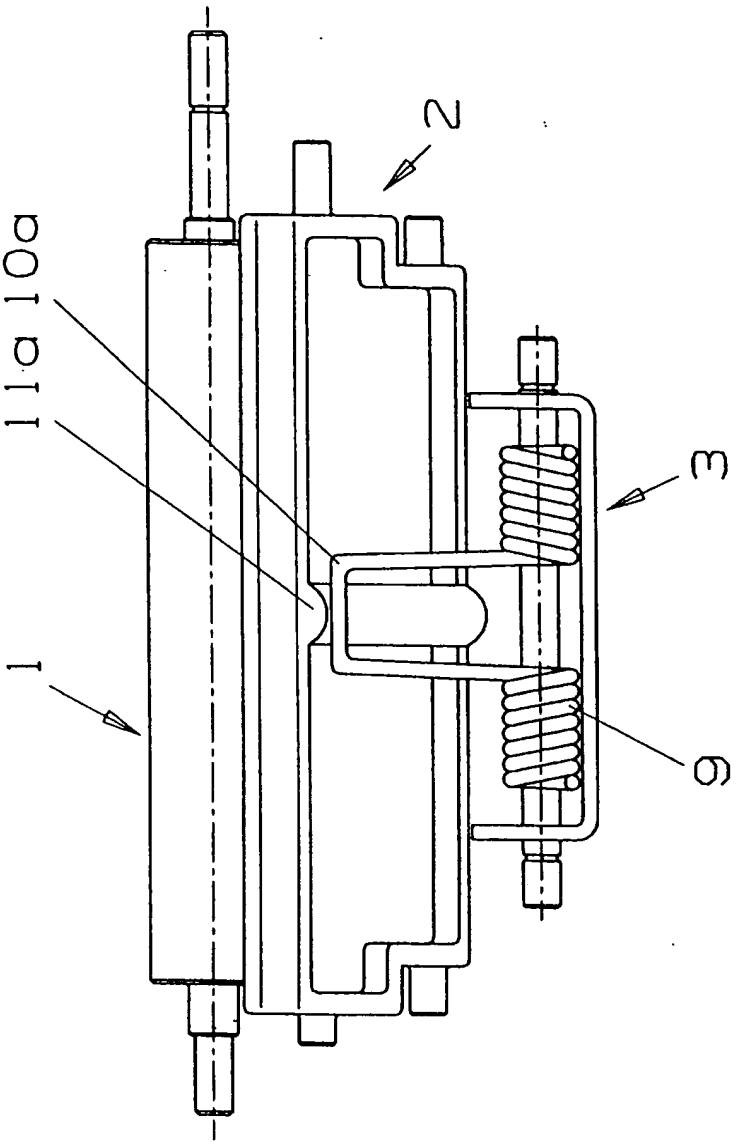


FIG. 5B

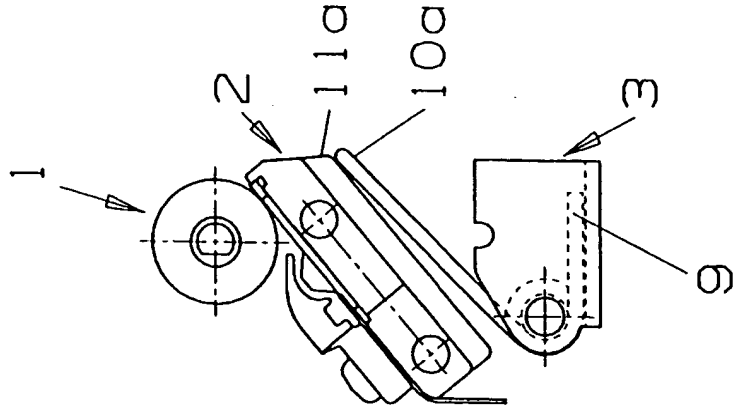


FIG. 6A

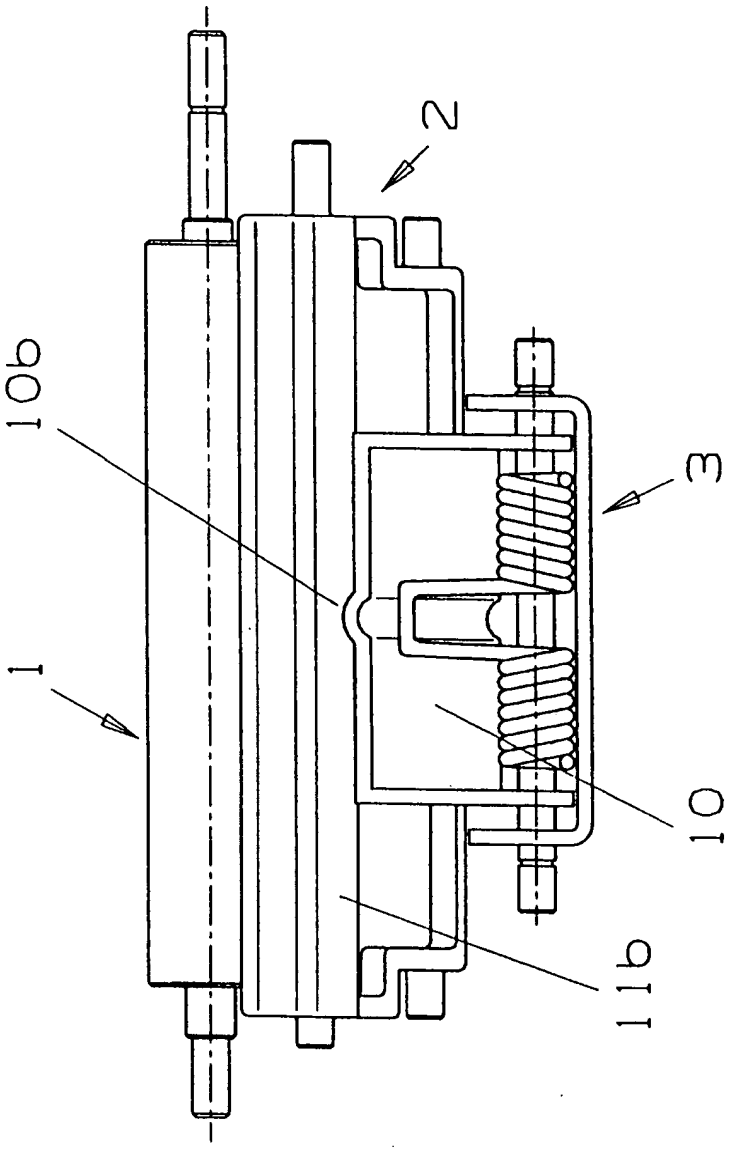


FIG. 6B

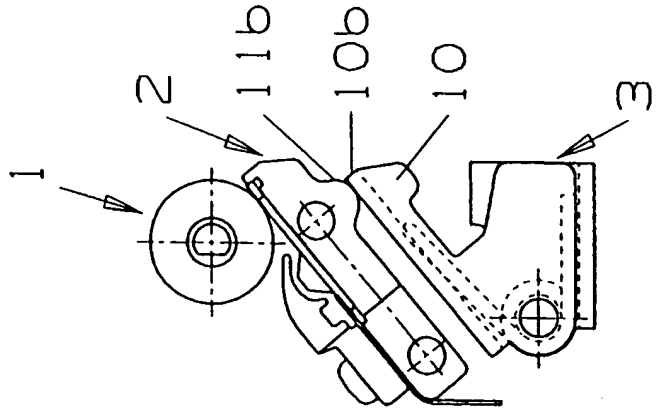


FIG. 7

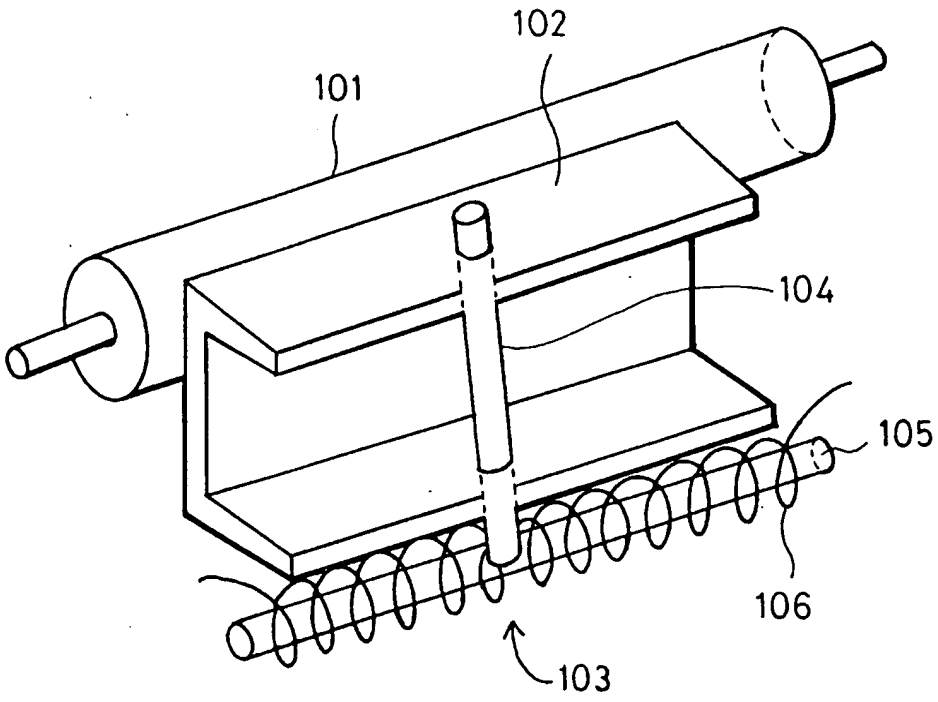


FIG. 8A

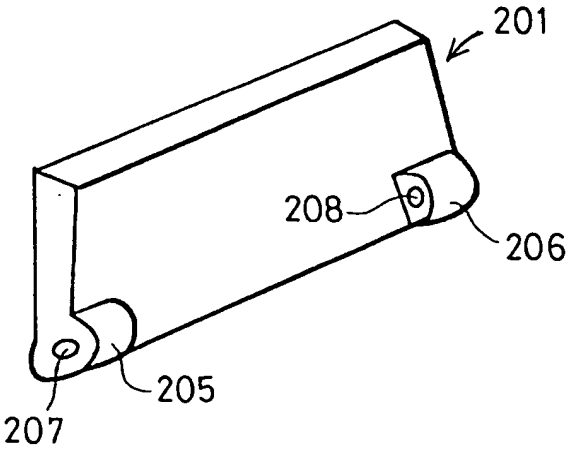


FIG. 8B

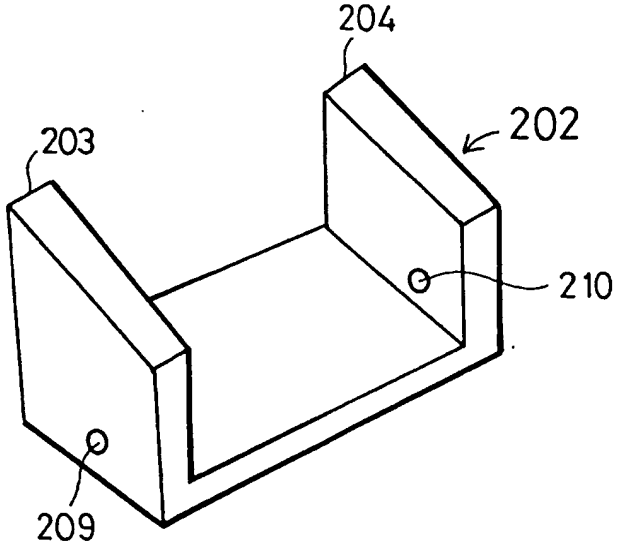


FIG. 9A

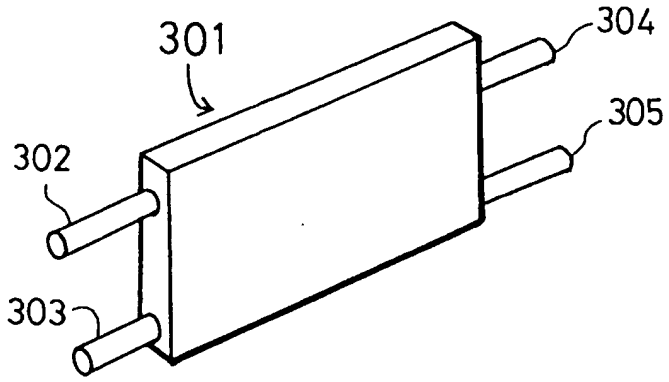
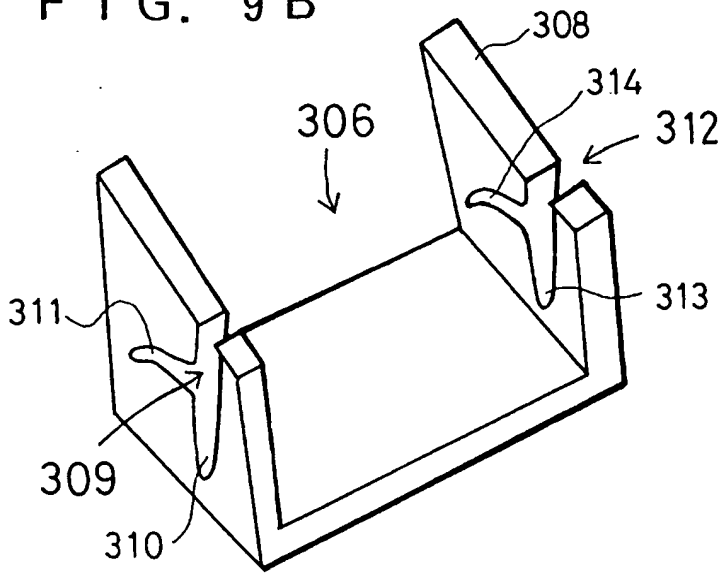


FIG. 9B



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP95/02277

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl^6 B41J25/316, B41J2/32

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Int. Cl^6 B41J25/316, B41J2/32

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho	1922 - 1996
Kokai Jitsuyo Shinan Koho	1971 - 1995
Toroku Jitsuyo Shinan Koho	1994 - 1996

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP, 3-275375, A (Tamura Electric Works, Ltd.), December 6, 1991 (06. 12. 91)(Family: none)	1 - 5
Y	JP, 59-143755, U (Toshiba Corp.), September 26, 1984 (27. 09. 84)(Family: none)	1 - 5
Y	JP, 1-226376, A (Seiko Epson Corp.), September 11, 1989 (11. 09. 89)(Family: none)	2

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
January 24, 1996 (24. 01. 96)	February 13, 1996 (13. 02. 96)
Name and mailing address of the ISA/ Japanese Patent Office	Authorized officer
Facsimile No.	Telephone No.

Form PCT/ISA/210 (second sheet) (July 1992)